THE AUXILIARY SCIENCE OF HISTORICAL CHRONOLOGY AND ITS ROLE FOR CLIMATOLOGISTS

Christian Rohr, University of Bern

Third CRIAS Workshop:

State of the Art of Historical Climatology in International Perspective

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Outline

- What is historical chronology?
- The solar calendar in the Roman and Christian tradition
  - Different beginning of the new year
  - Different styles to express the exact day
- The Gregorian calendar reform of 1582 and its relevance for historical climatology
  - Avoidance of “fake dates”
  - Exact dating of single events (e.g. floods, harvest time) according to the actual solar year
  - Harmonization of long series
- Outlook: Challenges of historical chronology in other areas

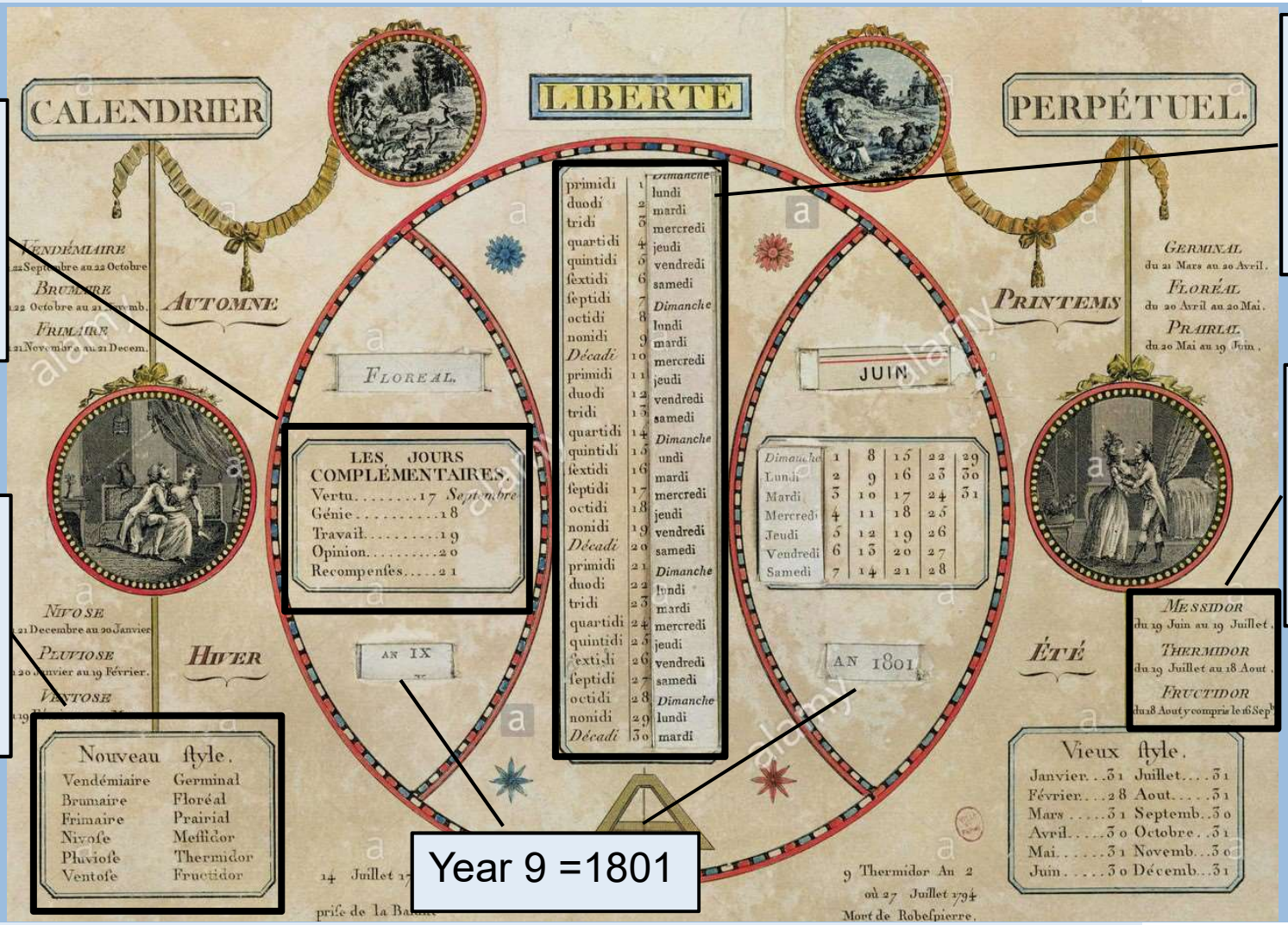
Historical chronology

- Auxiliary science of history dealing with the different systems to measure time
- Main task: search for the correct dating (year, date)
- Advanced knowledge in historical chronology is extremely important for historical climatology
  - Avoid doubled events
  - Harmonize between different systems of dating
- Basic tool by German historian Hermann Grotefend (1845-1931)
  - Handbuch der historischen Chronologie des deutschen Mittelalters und der Neuzeit (1872)
  - Zeitrechnung des deutschen Mittelalters und der Neuzeit, 2 vols. (1891-1898)
  - Taschenbuch der Zeitrechnung (17 editions since 1898)
  - Online: http://www.manuscripta-mediaevalia.de/gaeste/grotefend/grotefend.htm

Counting the years

- Olympiads (Greece)
- Roman Empire
  - From the foundation of Rome (Roman Empire)
  - In the year of the consuls X/Y (Roman Empire)
- From the creation of the world = 5507/5508 BC (Byzantine Empire)
- BC / AD (CE)
  - Introduced in 525 AD by Dionysius Exiguus
  - Propagated by Bede the Venerable, 8th c. AD
- From Mohammed's Hedschra = 622 AD (Islamic countries)
- From the beginning of the French Revolution = 1792 (French revolutionary period)
- From the beginning of the Fascist rule in Italy = 1922

Counting the years, months and days
The French revolutionary/republican calendar (1793-1806)



5 additional days in September

12 new months of 30 days each

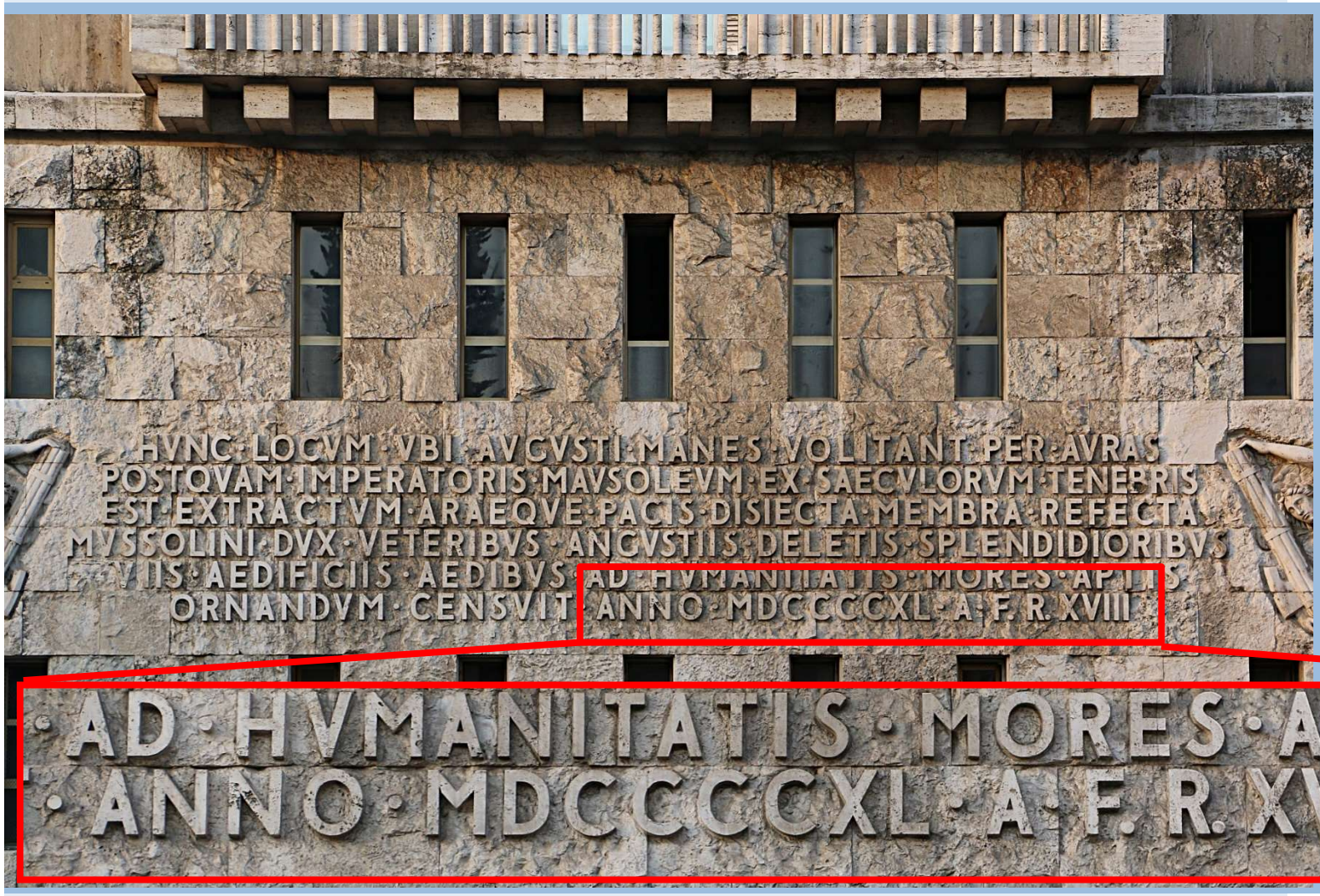
Three decades instead of weeks

months with "phenological" names

Year 9 =1801

Counting the years

Inscription on a living house in Rome erected by the Fascists in 1940 (18th year from the Fascist revolution)



Starting date of the year

- Circumcision style (**1 January**)
  - Germany (since 16th c.), France (since 16th c.), Russia (since 1701)
- Old pre-Caesarian Roman calendar (**1 March**, cf. September etc.)
  - Venice (until 1797), Russia (until 13th c.)
- Annunciation style (**25 March**)
  - Florence, Siena (later start), Pisa and others (earlier start)
  - Spain, Portugal (until 14th c.)
  - England (11th c. until 1752)
- Easter style (**changing dates in March/April**)
- Byzantine style (**1 September**)
  - Russia (13th c. until 1701)
- Christmas style (**25 December**)
  - Dominating in many European regions until the 16th c.

Systems to express the exact day

- Roman calendar system (valid also through the Middle Ages)
  - 12 months (starting with March)
  - Kalendae = 1st
  - Idus = 13th / 15th (March, May, July, October)
  - Nonae = 5th / 7th (March, May, July, October)
  - III [before] Id. Mart. = March 13th
- Dating according to Christian feasts
  - On Monday after St Laurence 1349
  - On Pfincztag (Thursday) before Pentecoste 1472
  - 35 different Easter constellations (see Grotefend)
- Modern system counting the days of a month
  - Widely spread since the Renaissance
  - Propagated by the early almanacs (printed calendars)

The Gregorian calendar reform

- Solar calendar introduced by Julius Caesar in 46 BC
  - Year: 365 days, 6 hours
  - One additional leap day every fourth year
- Solar Year is in fact 365 days, 5 hours, 48 minutes, 46 seconds
- 1582: 10 days difference between calendar and actual solar position
- Pope Gregory XIII – reform of the calendar system
  - Oct 4th 1582 = Oct. 14th 1582
  - No leap day in future in the years 1700, 1800, 1900, 2100 etc.
- Reform only accepted in the catholic countries
  - Protestant countries mostly followed this reform only from around 1700

The Gregorian calendar reform
Europe during the Reformation period

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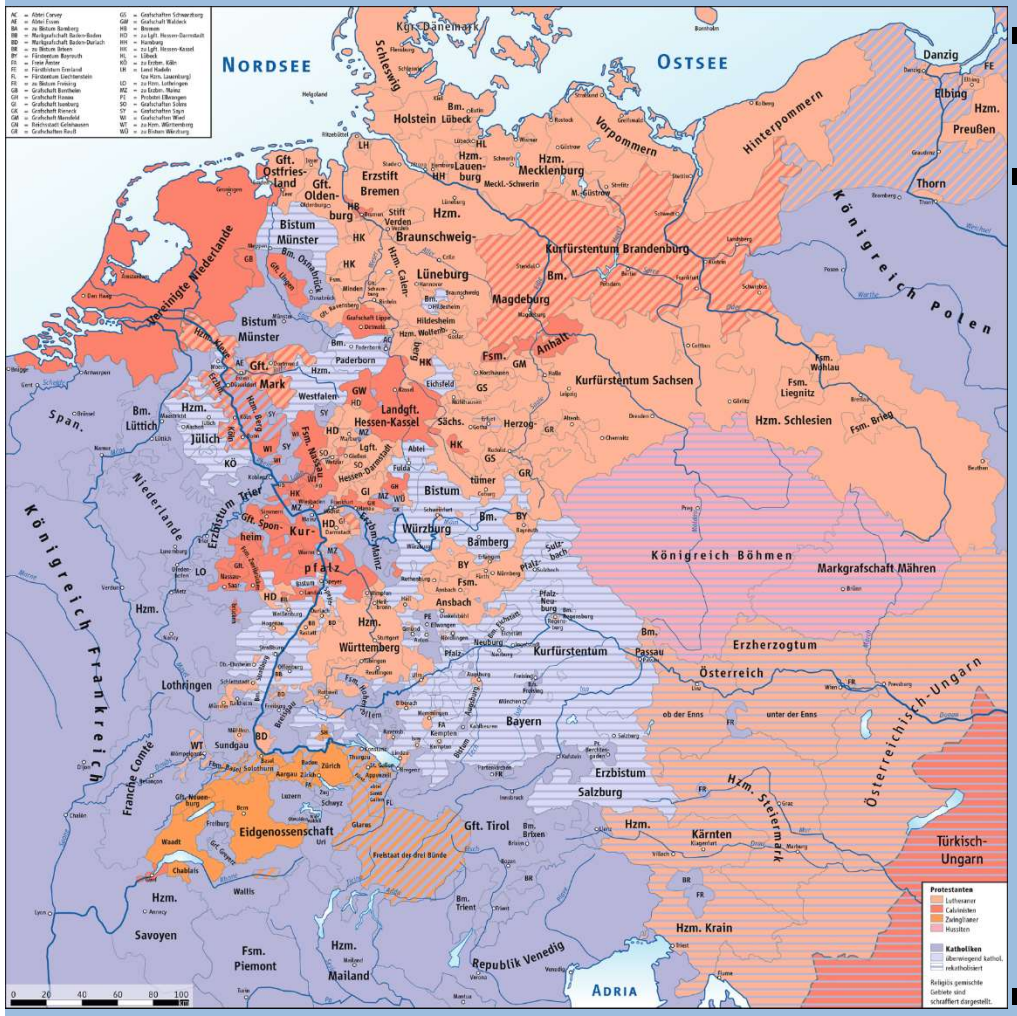

- Unity of the Christian church ends in the early 16th c.
- Struggle of confessions
  - Areas remaining catholic (Italy, Spain, Portugal, France, parts of the Hapsburg territories)
  - Lutheran church (northern Germany, Nordic countries, parts of the Hapsburg territories
  - Zwingli and Calvin (parts of Switzerland, France, Great Britain, Hungary, Netherlands)
  - Anglican church of England
- Peace of Augsburg (1555)

The Gregorian calendar reform
Introduction of the new calendar system

1582	Italy (most territories), Spain (including Spanish Netherlands), Portugal, France, Poland-Lithuania
1583	Most of the catholic territories in Germany, Hapsburg territories in Austria, Holland, Zealand
1584	Bohemia, Moravia, Silesia
1587	Hungary
1612	Prussia
1700	Protestant territories of the Holy Roman Empire, Denmark, Norway, North-eastern parts of the Netherlands
1752	Great Britain (including the British colonies in North America)
1753	Sweden
1873	Japan
1912	China
1917/18	Ottoman Empire, Russia
1923	Greece

The Gregorian calendar reform
The situation in Switzerland (confessions around 1700)

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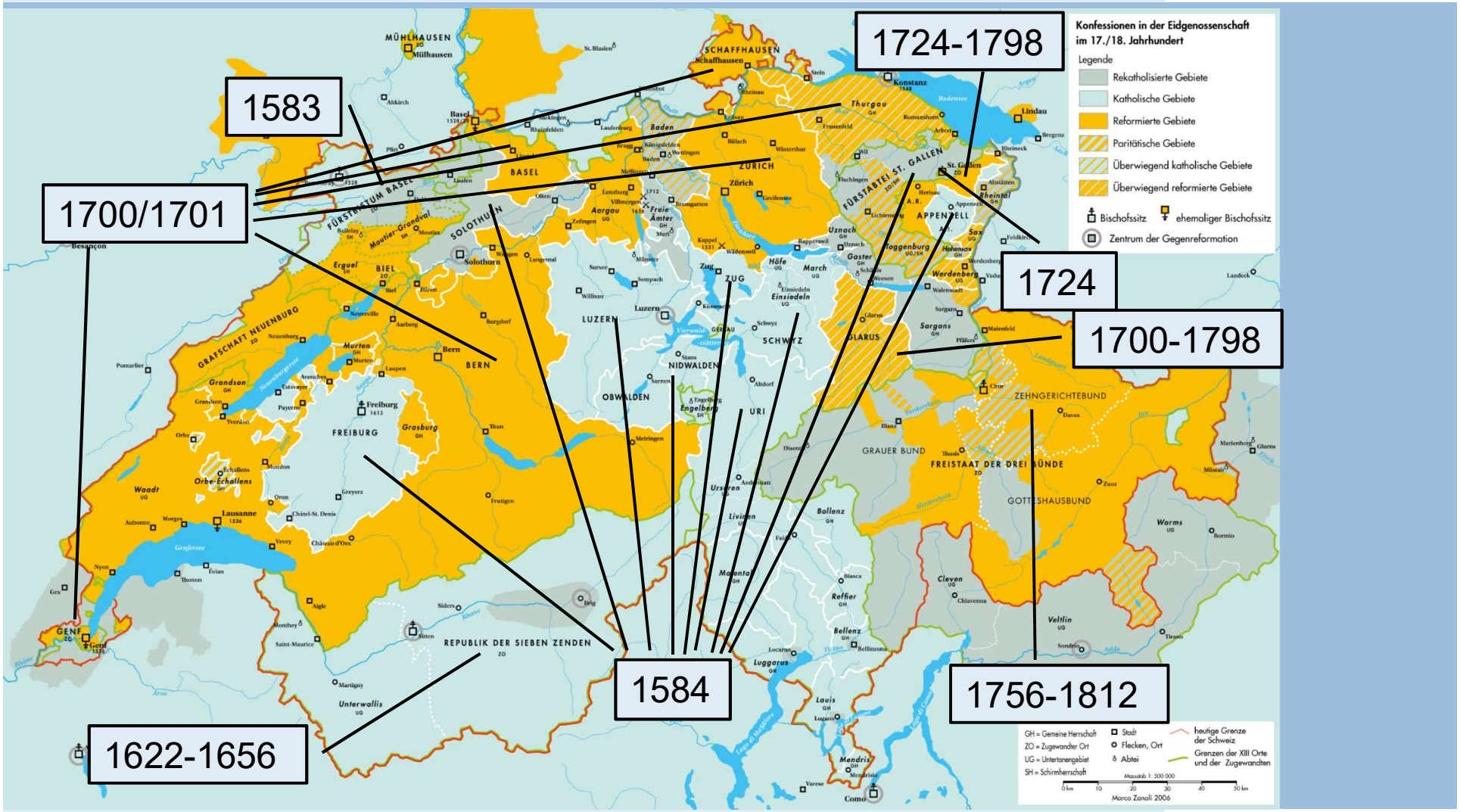

The Gregorian calendar reform
Almanacs covering the old and new calendar system

Almanac from the 1620s. Source: Historisches Archiv der Stadt Köln, Bestand Best. 150 (Universität), A 1092

Consequences for historical climatology

- Exact dating needs specific knowledge in auxiliary science of history and interdisciplinary cooperation
  - Use of the Grotefend handbook essential
  - Micro-spatial resolution necessary
- Specific dates (e.g. extreme events such as floods, avalanches)
  - Avoidance of “fake dates”, in particular for 25 December to 25 March
  - Harmonization of sources from regions with parallel systems
- Phenological data for climate reconstruction
  - Any data for plant phenology (bloom, harvest) and snow/ice phenology to be transferred into Gregorian style
  - Long-time series for pre- and post-1582 periods possible
  - Harvest data from regions with parallel systems can be combined with caution

Floods and ice-breakups of the Traun River
Beginning of bridge repairs in spring (1521-1599)

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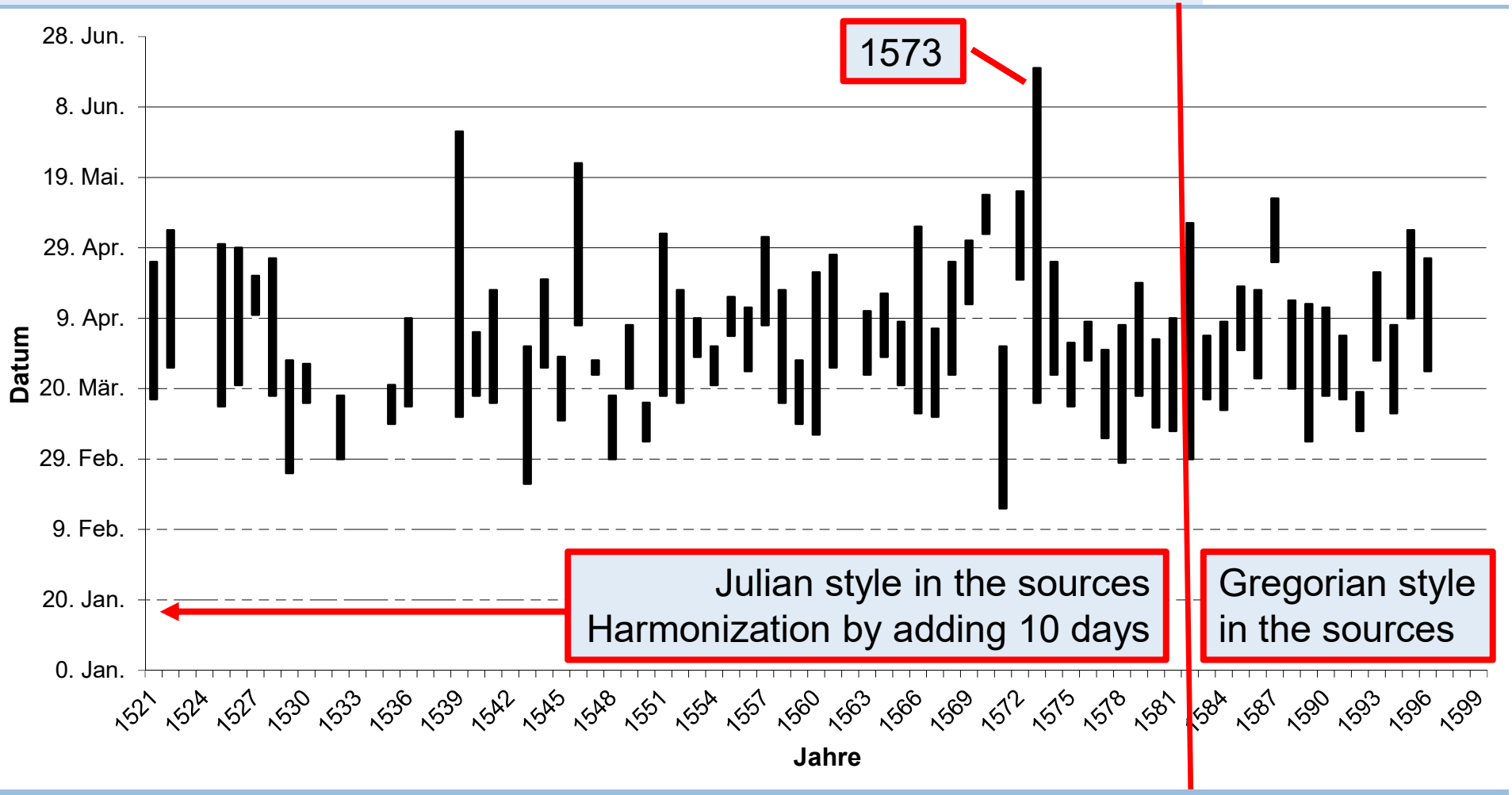

Figure based on: Wels, Municipal Archives, BAR 1521-1599; Rohr 2007: 210.

Outlook

- Enlarged cooperation of interdisciplinary teams for pre-modern European history of climate necessary
  - Cf. historical seismology: old earthquake catalogues “purified” from “fake quakes”, e.g. 25 January 1347 (instead of 1348)
  - Exact and harmonized dating as important task for Europe-wide databases such as *Euro-Climhist* (www.euroclimhist.unibe.ch)
- Situation in other regions of the world
  - Comparative studies about methodological problems in historical climatology
  - Islamic areas: problems arising with the lunar calendar?
  - Eastern Asia: problems with the parallel use of solar and lunar systems?
- Last minute call for cooperation or additional papers
  - Contribution to the special issue of *Climate of the Past*

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Thank you for your attention!

Christian Rohr

Institute of History
and
Oeschger Centre for Climate Change Research

University of Bern (Switzerland)
christian.rohr@hist.unibe.ch